TREATING WOOD FOR PROTECTION AND SERVICE

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TREATING WOOD FOR PROTECTION AND SERVICE

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Wood, as a raw material, generally requires less special treatment to fit it for service than most other raw materials. But a certain degree of preparation to enhance its qualities and prolong its usefulness is essential. This has long been recognized. The practice of painting wood, for example, arose before the dawn of history; likewise the gluing of wood, and the "pitching" of ships' planking.

In the modern era, there is double reason for carrying on such practices with care and skill. Not only is an exacting public to be served, but for every failure in wood's performance, technology is ready to press the claims of other materials that will meet requirements more closely, if not more cheaply. The service life of wood must be better safeguarded against both natural enemies and man-made hazards. Processes by which wood is prepared for special types of use must be developed and improved. In all this the active aid of research is needed. Investigations of the many kinds of treatments and applications required fall for the most part into four well defined fields: Preservative treatment; painting and finishing; fire-protective treatments; and gluing and related processes.

Decay, the greatest destroyer of timber in use, is ably assisted by insects and marine boring organisms. Thorough preservative treatment and proper precautions in construction are needed to thwart these harmful agencies. The degree of success attained in treatments gives wood today a strong position as an economical material for railway ties, poles, piling, and other outdoor timbering. Without such protection the movement toward concrete and metal for all kinds of structures subject to decay and insect damage would be greatly accelerated. There is still need for great improvement in preservatives and preservative methods, in order to increase their effectiveness, reduce the cost of wood per year of service, and make treated wood more generally available.

Various degrees of treatment are involved, depending upon the intended use—the heaviest treatments, with creosote, being required for piling in teredo-infested waters. Vast quantities of wood are wasted through insufficient penetration. Investigations of the effect of temperature and pressure

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in a thoroughgoing series of experimental treatments have shown how to gain better penetration by using moderate pressures with relatively high temperatures, thus obtaining higher mobility of the preservative liquid. As an important outgrowth of the temperature studies, new heat-conduction formulas for wood have been derived, placing the preheating stage of the preservative process on a basis of accurate control for the first time and removing it from the costly empiricism of the past.

A constant stream of new preservatives, of varying degrees of excellence, seek outlets among the consuming public. Some of these are offered for use by standard pressure-impregnation methods. Most, however, are recommended for surface or "brush" treatments. Despite many attempts to devise a quick test for judging preservative efficiency, the old method of service records, even though time-consuming, remains the only reliable one. Some 50,000 test specimens in great variety of size, character, treatment, and geographical placement, are at present under observation for the compilation of such records on a great number of preservatives. Meanwhile studies of the chemical principles of toxicity and tests with many species of wood-destroying fungi are laying groundwork for the development of new preservatives as a scientific undertaking rather than a promotional coup.

The one timber item most in need of preservative treatment today is farm fence posts, of which the number replaced each year by reason of decay is in the neighborhood of 400 million. Effective home treating methods hitherto offered have not found wide acceptance, and commercial treatments are beyond the reach of the majority of farmers. The most promising recent development in simplifying and cheapening fence post treatment is an adaptation of the Boucherie process, by which green, round, unpeeled posts of low decay-resistance can be made as durable as cedar at a cash outlay of 5 to 10 cents per post. The treating chemical is zinc chloride and the means of application is a used tire-tube stretched over the end of the post. The advantages of the method are obvious. Experiments with posts of a number of species are under way, and results thus far encourage the hope that post treatments by the tire-tube method may soon become common practice.

Red will no longer be the dominant color note of the American barn of the future, if research disclosures in regard to paint durability make their full impact. Exposre tests made throughout the country have proved that on all commercial lumber species the longest service and best all-around protection against weathering is rendered by paint in which the pigment is flake aluminum. The silvery luster of such paint will probably work against its acceptance for the complete painting of houses, but as a priming coat its use will often prove of distinct advantage.

This finding is one result of a broad investigation of wood painting, having as its practical objective a reduction of the consumer's paint bill, which now amounts to some half a billion dollars a year. Causes of paint blistering, cracking, peeling, and discoloration have been analyzed, means of avoiding abnormally early paint failures pointed out, and the paint-holding characteristics of different woods determined. It is in respect to
its lasting quality on the more difficult type of woods that aluminum paint has been found outstanding.

The role of moisture in walls as an enemy of paint has been discovered, accounting as it does for many paint troubles. The remedy in such cases lies not with the paint but with effective means to prevent moisture accumulation—although pure white lead is more resistant to moisture blistering than mixed pigments. An unsuspected factor of incompatibility has been found to lie in the chemical make-up of different paint pigments, so that certain sequences of coatings in repainting are now known to be safe, and others doomed to failure. Even for the owner who is deliberately neglectful of repainting, research gives information of value, for a coating of white lead or, in some climates, white lead and zinc oxide, is found to retain some of its appearance value long after its other surfacing qualities have given out.

It is believed that a revolutionary improvement in painting practice and paint purchasing can be brought about by a system of paint classification and grading roughly analogous to lumber grading and species selection. With this objective in view, a tentative system has been devised and is now being urged upon a reluctant industry for improvement and adoption. Ready-mixed-paint formulas are constantly changing and varying over a wide range in character and quality. The purchaser is generally at a loss to tell good paint from poor. Specific recommendations for the use of mixed-pigment prepared paints are almost impossible as long as the present confusion is allowed to continue, and a major effort on the part of paint technologists is needed to remedy this situation.

Wood is by nature a combustible substance, and efforts to make it "fireproof" in the sense that brick and stone are fireproof are beside the mark. Objectives in this regard must be confined to reducing fire hazards in construction and treating wood with materials that will reduce the speed of burning and check the spread of flame. By such means the danger of fire from causes both internal and external to the house can be held to a practical minimum, so that no just grievance can be brought against wood except for situations of extreme fire risk.

Of 150 chemical compounds and mixtures thus far tested as impregnating materials, those involving ammonium phosphate, ammonium sulphate, borax, and boric acid were found best. All require high absorptions of chemical for their full effect, and for that reason cannot be considered cheap. Resistance to decay, insects, and leaching can be combined with fire resistance, but these advantages, too, are gained at considerable cost. In the course of the investigations a yardstick of the effectiveness of a treatment was devised and has since been widely adopted, both in the United States and abroad. This is the fire-tube test, by which the loss of weight of a standard specimen is measured during the actual course of combustion.

Many fires originate from cigarette butts, burning match stems, and other sources. To prevent fires growing from such beginnings is half of the battle in reducing fire losses. Coatings that can be applied to the surface
with brush or spray gun, in contrast to impregnation treatments, offer promise in retarding the spread of fire. While no coating can yet be recommended for general use, research in this field is being actively prosecuted in the hope of developing a coating or coatings that can be used effectively and economically to prevent rapid spread of fire in walls and basements, and can be applied by the home owner in old or new structures.

In general estimation, plywood would never rate as a "fireproof" material. Yet it has been found that if the new phenolic resin glues are used in the making, a considerable factor of fire resistance is obtained—far more than when animal, casein, or vegetable glues are used. Plywood panels 1.7 inches thick, glued with phenolic resin adhesive and exposed to flame according to underwriters' standards, resisted burning through for a whole hour.

The constant improvement of glues and gluing is a vital part of wood utilization research. Glue for centuries has been a stout companion to wood in meeting difficult requirements of fabrication. By contributing to smoothness and strength of joining, it has multiplied the serviceability of wood in the hands of the craftsman. As new demands devolve on wood, the demands on glue become all the more urgent. Better gluing gives better plywood for more exacting uses. Control of gluing technique makes for dependable veneered products and supplies the average home with better, stronger, and more attractive furniture. Water-resistant glues make possible built-up and laminated construction broad new fields of service—in building, in transportation, in aeronautics. To an unpredictable degree, the future of wood lies with scientific developments in gluing.

The Laboratory's first major studies in this field resulted in the discovery of basic principles of good gluing with starch, animal, casein, and blood glues—findings which for the first time made gluing a sound technology instead of the mysterious rule-of-thumb practice it had been for ages. Other results were determination of the gluing properties of more than 40 species of wood, the development of new and better low-cost casein and blood glues, and the formulation of the first reliable methods for testing the strength, water resistance, and durability of glue joints. Hot-press resin glues of outstanding moisture resistance are now available in increasing numbers, and studies are proceeding in the special techniques involved in their use. Some of these glues are found to retain a large percentage of their original strength over several years of severe exposure to alternate wetting and drying. Their performance in this respect is far superior to that of any of the older types. An economical cold-press glue having the high strength and water resistance of the hot-press resin glues would be a further help in woodworking, by permitting the gluing of larger and thicker material. Such a glue may be developed through research that is now in progress at industrial establishments. The Laboratory's studies at present are centered on determination of maximum durability and strength obtainable from the resin glues and on setting up minimum performance requirements. Large-scale outdoor tests are under way to determine the durability of the glue joints, the extent to which the face veneers resist checking, and the protective value of various surface finishes. These tests supplement thousands of small-scale accelerated laboratory tests.
Experience in the testing of glued veneers and plywood indicates that products of superior quality are the result of both good gluing and good cutting of the unit plies. No thoroughgoing study of the veneer cutting process in all its phases has yet been made. Research in that field contemplated, with the use of equipment now available. The work in view involves determination of methods for preparing the logs, optimum conditions for producing quality veneers from woods of different species, and methods for reducing waste in cutting. With all possible underlying facts developed to guide the production of veneer, its gluing into composite forms, and the testing of the products for strength and serviceability, together with steady prosecution of research in general gluing practice, painting, and protective treatments, wood will be the better prepared for effective performance in fields of utilization both old and strictly modern.